## **CLAIMS**

## What is claimed is:

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A protein having an amino acid sequence comprising at least 30 contiguous amino acids of SEQ D NO:4, wherein said protein does not have a fatty acid acylated cysteine followed by the amino acid sequence Trp Asp Lys Glu, and does not have a C-terminal homoserine lactone.

- 2. The protein of claim 1 having an amino acid sequence comprising at least 50 contiguous amino acids of SEQ ID NO:4.
- 3. A protein having an amino acid sequence comprising at least amino acids 1-30 of SEQ ID NO:4.
- 4. The protein of claim 3 having an amino acid sequence comprising SEQ ID NO:4.
- 5. The protein of claim 1 which is an isolated protein.
- 6. The protein of claim 1 which is a fusion protein.
- 7. The protein of claim 6, in which the fusion protein is a thioredoxin fusion protein.
  - A composition comprising the protein of claim 1 and a pharmaceutically acceptable carrier.
- 25 9. The composition of claim 8, further comprising an adjuvant.
  - The composition of claim 8, further comprising at least one polypeptide selected from the group consisting of *Mycoplasma hyopneumoniae* P46, P65, P97 and P102.

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An immunogenic protein having an amino acid sequence as depicted in SEQ ID NO:2, or a fragment, variant or derivative thereof, wherein the immunogenic protein does not have a fatty acid acylated cysteine followed by the amino acid sequence Trp Asp Lys Glu, and does not have a C-terminal homoserine lactone.

12. An immunogenic protein having an amino acid sequence as depicted in SEQ ID NO:4, or a fragment, variant or derivative thereof, wherein the immunogenic protein

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does not have a fatty acid acylated cysteine followed by the amino acid sequence Trp Asp Lys Glu, and does not have a C-terminal homoserine lactone.

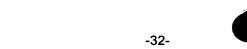
- 13. A method of treating or preventing a disease or disorder in an animal caused by infection with *Mycoplasma hyopneumoniae* comprising administering to the animal a vaccine formulation comprising (i) a protein having an amino acid sequence comprising at least 30 contiguous amino acids of SEQ ID NO:4, wherein said protein does not have a fatty acid acylated cysteine followed by the amino acid sequence Trp Asp Lys Glu, and (ii) a pharmaceutically acceptable carrier, in an amount sufficient to elicit an increase in *Mycoplasma hyopneumoniae* specific cellular or humoral responses.
  - 14. The method of claim 13, wherein said protein has an amino acid sequence comprising at least 50 contiguous amino acids of SEQ ID NO:4.
  - 15. A method of treating or preventing a disease or disorder in an animal caused by infection with *Mycoplasma hyopneumoniae* comprising administering to the animal a vaccine formulation comprising (i) an antigenic or immunogenic protein having an amino acid sequence comprising at least amino acids 1-30 of SEQ ID NO:4, and (ii) a pharmaceutically acceptable carrier, in an amount sufficient to elicit an increase in *Mycoplasma hyopneumoniae* specific cellular or humoral responses.
    - 16. The method of claim 15, wherein said protein has an amino acid sequence comprising SEQ ID NO:4.
    - 17. The method of claim 13, wherein said animal is a pig.
- 18. An isolated or purified DNA encoding in the mycoplasmal genetic code a protein having an amino acid sequence comprising at least 30 contiguous amino acids of SEQ ID NO:2, or its complement.
  - 19. The DNA of claim 18, wherein the protein has a sequence comprising at least 50 contiguous amino acids of SEQ ID NO:2.
- The DNA of claim 18, wherein the DNA has a sequence comprising at least 90 contiguous nucleotides of SEQ ID NO:1.

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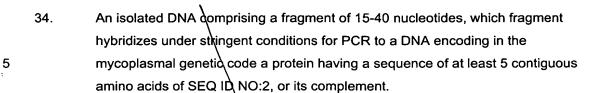
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- 21. A DNA encoding in the universal genetic code a protein having an amino acid sequence comprising at least 30 contiguous amino acids of SEQ ID NO:4, or its complement.
- 5 22. The DNA of claim 21, wherein the protein has a sequence comprising at least 50 contiguous amino acids of SEQ ID NO:4.
  - 23. The DNA of claim 21, wherein the DNA has a sequence comprising at least 90 contiguous nucleotides of SEQ ID NO:3.
  - 24. The DNA of claim 22 operably linked to a heterologous promoter.
  - 25. The DNA of claim 24 which further comprises an origin of replication active in a prokaryotic cell.
  - 26. The DNA of claim 24 which further comprises an origin of replication active in a eukaryotic cell.
  - 27. A host cell comprising the isolated DNA of claim 24.
  - 28. The host cell of claim 27, wherein said cell is *E. coli* BL21 and said DNA is the expression vector pBAD/Thio-TOPO.
- 29. A method for the production of apo-Mhp3 or a fragment thereof, said method
  25 comprising (i) growing the cells of claim 27 under conditions wherein apo-Mhp3 is
  expressed, and (ii) recovering said protein.
  - 30. The method of claim 29, wherein said protein is recovered in a soluble form.
- 30 31. The method of claim 29, wherein said protein is recovered in an insoluble form.
  - 32. A method of treating or preventing a disease or disorder in an animal caused by infection with *Mycoplasma hyopneumoniae* comprising administering to the animal a vaccine formulation comprising (i) the DNA of claim 20, and (ii) a pharmaceutically acceptable carrier, in an amount sufficient to elicit an increase in *Mycoplasma hyopneumoniae* specific cellular or humoral responses.



35. The isolated DNA of claim 34, wherein the hybridization is specific to *M. hyopneumoniae*.

The method of claim 32 wherein said animal is a pig.

36. An isolated DNA comprising a fragment of at least 90 nucleotides, which fragment hybridizes under conditions of high stringency for filter hybridization to a DNA encoding-in-the-mycoplasmal-genetic code a protein-having-a-sequence-of-at-least 30 contiguous amino acids of SEQ ID NO:2, or its complement.

37. A kit comprising in at least one container a first isolated DNA comprising a fragment of at least 15 nucleotides, which fragment hybridizes under stringent conditions for PCR to a DNA encoding in the mycoplasmal genetic code a protein having a sequence of at least 5 contiguous amino acids of SEQ ID NO:2, and a second isolated DNA comprising a fragment of at least 15 nucleotides, which fragment hybridizes under stringent conditions for PCR to a DNA complementary to a DNA encoding in the mycoplasmal genetic code a protein having a sequence of at least 5 contiguous amino acids of SEQ ID NO:2, wherein said kit comprises a statement indicating that the kit is useful for diagnosis of *M. hyopneumoniae* infection.

38. The kit of claim 37, wherein the hybridization is specific to *M. hyopneumoniae*.

39. A kit comprising in at least one container the isolated DNA of claim 34, wherein the hybridization is specific to *M. hyopneumoniae* and wherein said kit comprises a statement indicating that the kit is useful for diagnosis of *M. hyopneumoniae* infection.

40. A kit comprising in at least one container a protein having an amino acid sequence comprising at least 30 contiguous amino acids of SEQ D NO:4 and a statement indicating that the kit is useful for diagnosis of *M. hyopneumoniae* infection.

41. The kit of claim 40, further comprising an anti-pig secondary antibody.

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- 42. The kit of claim \$1, in which the secondary antibody is conjugated to an enzyme that catalyzes a colorimetric reaction.
- The kit of claim 42, wherein the enzyme is selected from the group consisting of alkaline phosphatase and horseradish peroxidase.
  - 44. The kit of claim 42, further comprising reagents for a colorometric assay.